Trend Study 7-7-01

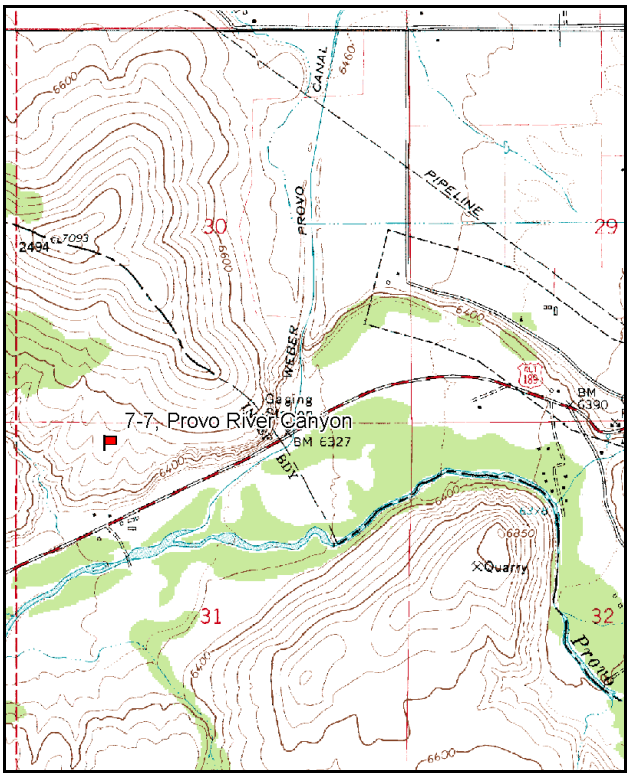
Study site name: Provo River Canyon . Vegetation type: Big Sagebrush-Grass .

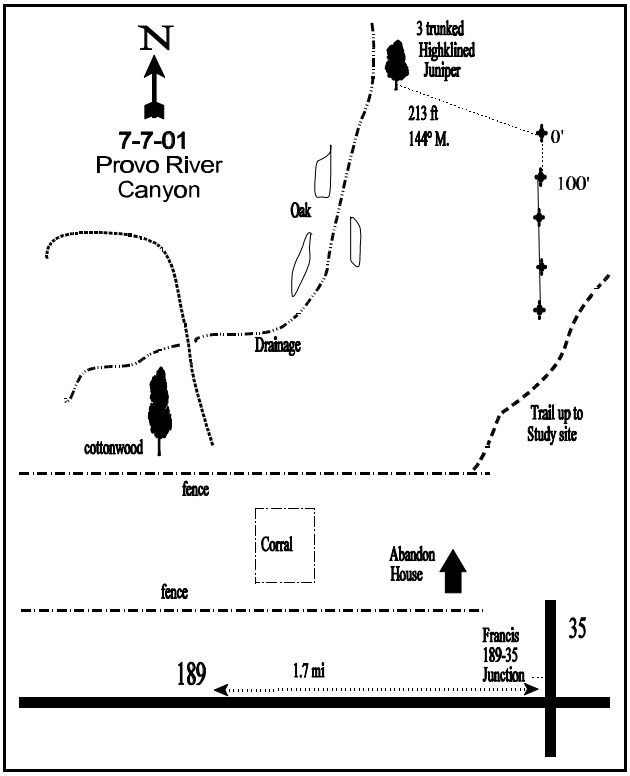
Compass bearing: frequency baseline 160 degrees.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the 189/35 junction in Francis, proceed west on 189 for 1.7 miles and stop at an old corral in a marshy pasture on the right (north). Walk to the large, narrow-leaf cottonwood northwest of the corral. The tree is at the mouth of a small canyon. Walk up the canyon approximately 500 feet until reaching the first drainage on the right. A drainage begins where the road crosses the creek for the second time. Walk up this drainage past the oak clumps to a point where the gully flattens out. To the right locate a 3-trunked, high-lined juniper. From the juniper, walk 213 feet at 144 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7960. The baseline runs in a direction of 160 degrees magnetic.





Map Name: Francis

Diagrammatic Sketch

Township 2S , Range 6E , Section 31

UTM 4495230 N 473439 E

DISCUSSION

Trend Study No. 7-7

The Provo River Canyon site samples a narrow band of critical deer winter range located north of the Provo River and west of Francis. The physiography of this study area is characterized by steep, sometimes sheer bluffs bordering the Provo river valley. The principal winter range lies on gentle rolling terrain above the bluffs. Apart from isolated patches of Gambel oak and mixed mountain brush, the remaining area is occupied by the big sagebrush/grass type with scattered individuals of bitterbrush. Most of the area has a southern aspect. The study is on a nearly flat ridge (5% slope) with an elevation of approximately 6,700 feet.

Judging from frequency of pellet groups and the level of forage utilization, use by grazing and browsing animals is light to moderate. Cattle and sheep alternately use the area in the spring-fall period, but obtain little benefit because of the shortage of herbaceous forage. Winter big game use includes elk and mostly deer. In 1996, pellet group quadrat frequency was only 2% for elk and 30% for deer. During the 2001 reading, deer pellet group quadrat frequency remained similar at 26%. A pellet group transect read on site in 2001 estimated 35 deer and 3 elk days use/acre (86 ddu/ha and 7 edu/ha). Rabbit pellets were abundant. Deer pellet groups were primarily from winter use but some groups were recent indicating a few resident deer use the area during the spring and summer.

Soil at the site is relatively deep with an effective rooting depth of almost 15 inches. It has a clay loam texture with a neutral soil reaction (6.6 pH). Vegetation, litter, and cryptogamic cover are high leaving little unprotected bare ground. Where limited erosion has occurred in the past, it is now stabilized and the erosion condition class was determined to be stable in 2001.

The site supports a dense stand of mountain big sagebrush (*Artemisia tridentata vaseyana*) which displays some characteristics of basin big sagebrush (*Artemisia tridentata tridentata*). Mature plants are tall averaging 3 feet in height with a crown of nearly 4 feet. Population density was estimated at over 4,000 plants/acre in 1996 and 2001. Average cover of sagebrush is over 30% which limits herbaceous understory production. Utilization of sagebrush was moderate to heavy in 1984 and 1990, but light to moderate in 1996 and 2001. Percent decadence was high in 1990 at 57% with one-third of the plants sampled expressing poor vigor. Percent decadence declined and poor vigor improved in 1996, which was a wetter year than 1990. Precipitation was again low in 2001, as percent decadence rose from 20% in 1996 to 37%. Twenty-two percent the sagebrush were classified with poor vigor. Both conditions obviously caused by drought combined with intense interspecific competition. This area would benefit from some sagebrush thinning.

The most preferred browse is antelope bitterbrush. It tends to be heavily hedged and somewhat decadent because of its relatively low density compared to all other browse species. This is an area where antelope bitterbrush comprises, on average, only about 5% of the shrub cover. In the past, bitterbrush would have been much more numerous. The population has been lost, mostly because of competition with sagebrush combined with heavy use and being on a southern aspect. Density of bitterbrush was estimated at 866 plants/acre in 1984, declining steadily to 180 plants/acre in 1996. Only 240 plants/acre were estimated in 2001. The population was mostly decadent in 1984 and 1990. It appears that all of the decadent plants have died off and no decadent plants were sampled in 2001. Recruitment is poor with no seedlings or young plants encountered in 1996 or 2001. The only other browse species found on the site include a few serviceberry, stickyleaf low rabbitbrush, and pricklypear cactus.

The herbaceous understory is poor for this high of a site with grasses and forbs combining to produce only 15% cover in 1996 and 17% in 2001. Perennial grasses are represented by bluebunch wheatgrass, Sandberg bluegrass, bottlebrush squirreltail, and small amounts of crested wheatgrass and Great basin wildrye.

Cheatgrass, an annual, was abundant in 1996, when it accounted for over half of the grass cover. Due to the dry conditions of 2001, cheatgrass has declined significantly in nested frequency and cover has dropped from 8% to 2%. Forbs are diverse but few species are abundant. Perhaps due to the decline in cheatgrass, annual and perennial forbs have increased in sum of nested frequency and cover in 2001. Most notable is silky milkvetch which was not sampled in 1996 but in 2001, it provided 56% of the forb cover. The only other common perennial forb consists of small numbers of silvery lupine and longleaf phlox. Several small annual forbs are abundant and include slenderleaf collomia, blue-eyed Mary, owlclover, and pale alyssum.

1984 APPARENT TREND ASSESSMENT

Soil and vegetative trends both appear stable but at a rather low condition rating. Understory composition and production are generally lacking, but have not obviously declined further since 1977 studies. Moreover, soil condition has not greatly changed over such a short period. The poor potential sites are unlikely to improve over any short period of time, while the better, deeper soil sites could erode if shrub cover were to be seriously depleted. However, the potential for that occurring are not serious.

1990 TREND ASSESSMENT

The slopes above Provo River support extensive stands of dense sagebrush. The site has a southwest exposure. There is a consistent 32% canopy cover for sagebrush. The moderately hedged hybrid sagebrush are relatively tall, nevertheless still identified as *Artemisia tridentata vaseyana*. Since 1984, density has decreased slightly and the proportion of decadent plants in the population increased to 57%. The somewhat scarce bitterbrush are sought out by livestock and deer. With continued heavy utilization, competition, and extended drought (1987-90), it has resulted in a decline in density. There are as many bitterbrush skeletons as living plants. The remaining plants are severely clubbed and decadent with poor vigor. Due to the extremely low leader growth this year, little forage production is available. Eighty-eight percent of the population was classified as decadent. Rabbitbrush and prickly-pear cactus have not increased. Grass density is low and forbs are still uncommon. Even with the limited perennial understory (cheatgrass is common), there is adequate ground cover with no sign of erosion.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - stable (3)

1996 TREND ASSESSMENT

The trend for soil is stable with good litter and vegetative cover and percent bare ground has decreased slightly. Bitterbrush appears to have stabilized at a lower density, with improved vigor. In addition, percent decadence has dropped from 88% down to only 11% even though use is about the same as it was in 1990. The key browse species for this site is mountain big sagebrush which makes up 96% of the browse cover. It also has greatly improved vigor, lower use, and percent decadence has decreased from 57% to 20%. The age structure for both species is mostly mature, but both species are long-lived and appear to have “weathered” the extended drought (1987-90) for now. Trend for browse is slightly improving. Trend for the herbaceous understory is slightly down. Perennial grass sum of nested frequency is down slightly, as it is for perennial forbs.

TREND ASSESSMENT
soil - stable (3)
browse - slightly improved (4)
herbaceous understory - slightly down (2)

2001 TREND ASSESSMENT

Trend for soil is down slightly due to a 40% increase in cover of bare ground and a slight decline in litter cover. There is still good protective ground cover and erosion is not currently a problem. The soil erosion condition class was determined as stable. Trend for browse is down slightly. Density and utilization of the key species, mountain big sagebrush, has remained similar to 1996 estimates. However, due to the high interspecific competition combined with drought, percent decadence has increased from 20% to 37%. In addition, 22% of the sagebrush sampled display poor vigor, up from 3% in 1996. The sagebrush on this site needs thinning. Average cover is estimated at 31% which is high enough to suppress understory species. Thinning would also improve the general health of the stand. Sagebrush recruitment is currently poor and the population will likely decline slightly in density in the future. Antelope bitterbrush is of secondary importance due to its low abundance. It displays continued moderate to heavy use but vigor is good and no decadent plants were sampled. Trend for the herbaceous understory is up. Sum of nested frequency for perennial grasses and forbs has increased while nested frequency of cheatgrass has declined significantly. Sandberg bluegrass increased significantly in nested frequency as all other perennial grasses remained stable. Perennial forbs are still lacking but nested frequency for silky milkvetch increased significantly. It now produces over half of the forb cover. Several small annual forbs also increased significantly in nested frequency.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - up (5)

HERBACEOUS TRENDS --
Herd unit 07 , Study no: 7

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron cristatum	8	13	10	19	3	4	3	6	.68	.48
G	Agropyron dasystachyum	$_{c}$87	$_{b}$34	$_{a}$3	$_{ab}$11	38	13	1	5	.00	.08
G	Agropyron spicatum	$_{a}$25	$_{b}$79	$_{c}$124	$_{bc}$87	14	30	39	35	2.71	2.32
G	Bromus japonicus (a)	-	-	-	3	-	-	-	1	-	.00
G	Bromus tectorum (a)	-	-	$_{b}$276	$_{a}$157	-	-	84	62	7.47	1.51
G	Elymus cinereus	-	-	7	-	-	-	2	-	.03	.00
G	Poa secunda	$_{a}$38	$_{c}$141	$_{b}$84	$_{c}$169	16	60	35	61	2.37	5.51
G	Sitanion hystrix	$_{a}$13	$_{ab}$25	$_{b}$33	$_{b}$36	6	15	19	18	.92	.60
Total for Annual Grasses		0	0	276	160	0	0	84	63	7.47	1.51
Total for Perennial Grasses		171	292	261	322	77	122	99	125	6.72	9.02
Total for Grasses		171	292	537	482	77	122	183	188	14.19	10.53
F	Agoseris glauca	$_{a}$-	$_{b}$9	$_{ab}$2	$_{a}$-	-	5	1	-	.01	-
F	Allium acuminatum	3	-	-	-	2	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	18	20	-	-	8	8	.04	.07
F	Allium spp.	-	-	-	2	-	-	-	1	-	.00

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Arabis spp.	-	1	-	6	-	1	-	2	-	.03
F	Astragalus cibarius	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$113	-	-	-	49	-	3.39
F	Astragalus convallarius	8	6	3	10	4	3	1	3	.00	.04
F	Astragalus spp.	2	-	5	-	1	-	3	-	.01	-
F	Calochortus nuttallii	1	-	-	-	1	-	-	-	-	-
F	Collomia linearis (a)	-	-	$_{a}$18	$_{b}$76	-	-	8	37	.09	.40
F	Collinsia parviflora (a)	-	-	$_{a}$15	$_{b}$103	-	-	5	37	.02	1.18
F	Crepis acuminata	8	13	7	6	4	9	3	2	.06	.06
F	Draba spp. (a)	-	-	-	2	-	-	-	2	-	.03
F	Epilobium brachycarpum (a)	-	-	1	-	-	-	1	-	.00	-
F	Erigeron pumilus	7	3	-	-	4	2	-	-	-	-
F	Gayophytum ramosissimum (a)	-	-	-	4	-	-	-	1	-	.03
F	Holosteum umbellatum (a)	-	-	-	11	-	-	-	6	-	.08
F	Lomatium triternatum	-	-	3	1	-	-	1	1	.00	.00
F	Lupinus argenteus	$_{a}$-	$_{a}$-	$_{ab}$2	$_{b}$19	-	-	2	7	.15	.14
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$13	-	-	-	6	-	.03
F	Orthocarpus spp. (a)	-	-	$_{a}$4	$_{b}$36	-	-	4	16	.08	.42
F	Phlox longifolia	$_{a}$-	$_{b}$23	$_{a}$2	$_{b}$23	-	12	1	10	.00	.07
F	Ranunculus testiculatus (a)	-	-	-	1	-	-	-	1	-	.00
F	Senecio integerrimus	-	-	-	2	-	-	-	1	-	.03
F	Taraxacum officinale	-	-	-	1	-	-	-	1	-	.03
F	Unknown forb-perennial	$_{b}$16	$_{a}$-	$_{a}$-	$_{a}$-	8	-	-	-	-	-
F	Vicia americana	-	4	-	-	-	2	-	-	-	-
Total for Annual Forbs		0	0	56	266	0	0	26	114	0.23	2.26
Total for Perennial Forbs		45	59	24	183	24	34	12	77	0.25	3.81
Total for Forbs		45	59	80	449	24	34	38	191	0.50	6.08

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 07 , Study no: 7

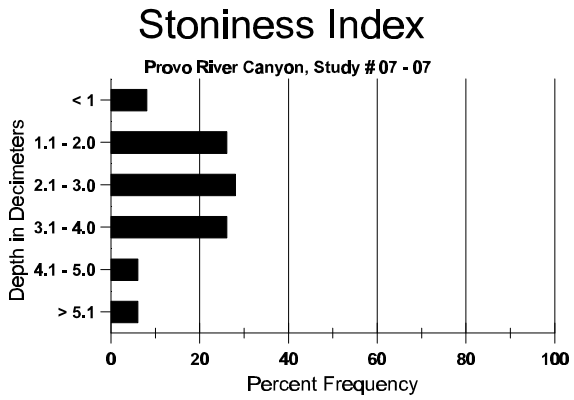
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Amelanchier alnifolia	0	0	-	.00
B	Artemisia tridentata vaseyana	94	92	32.32	31.06
B	Chrysothamnus viscidiflorus viscidiflorus	1	1	.00	.03
B	Opuntia spp.	5	3	.03	.03
B	Purshia tridentata	9	9	1.14	1.87
Total for Browse		109	105	33.51	33.00

BASIC COVER --
Herd unit 07 , Study no: 7

Cover Type	Nested Frequency '96	Nested Frequency '01	Average Cover % '84	Average Cover % '90	Average Cover % '96	Average Cover % '01
Vegetation	350	332	2.00	6.50	50.12	50.18
Rock	91	52	.25	1.25	1.44	1.78
Pavement	106	114	1.75	3.75	.66	1.12
Litter	398	386	69.50	66.25	58.95	50.43
Cryptogams	106	96	13.25	14.00	4.69	7.43
Bare Ground	149	182	13.25	8.25	7.22	18.03

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 07, Provo River Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.7	55.6 (15.6)	6.6	41.8	27.4	30.7	3.6	23.2	275.2	.4



PELLET GROUP FREQUENCY --
Herd unit 07 , Study no: 7

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'01	'01	'01
Rabbit	9	31	1027	N/A
Elk	2	-	35	3 (7)
Deer	30	26	452	35 (86)
Cattle	-	-	17	1 (3)

BROWSE CHARACTERISTICS --
Herd unit 07 , Study no: 7

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	00%	00%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	0		-
	'01	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	5	-	-	-	-	-	-	-	-	4	-	1	-	333			5
	90	6	1	1	5	-	-	-	-	-	10	-	3	-	866			13
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	01	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	13	28	18	-	-	-	-	-	-	57	-	2	-	3933	33	28	59
	90	4	14	6	2	-	-	-	-	-	22	-	4	-	1733	30	27	26
	96	86	67	4	1	-	-	-	-	-	158	-	-	-	3160	34	51	158
	01	65	47	7	11	-	-	-	-	-	108	1	21	-	2600	36	43	130
D	84	5	10	16	-	-	-	-	-	-	23	-	8	-	2066			31
	90	14	25	10	2	1	-	-	-	-	31	1	7	13	3466			52
	96	23	9	7	2	1	-	-	-	-	35	-	-	7	840			42
	01	48	21	7	2	-	2	-	-	-	52	2	6	20	1600			80
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	920			46
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	720			36

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	40%	36%	12%	- 4%
'90	45%	19%	30%	-32%
'96	37%	05%	03%	+ 4%
'01	32%	07%	22%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	6332	Dec:	33%
	'90	6065		57%
	'96	4120		20%
	'01	4280		37%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133	11	10	2
	90	1	-	-	1	-	-	1	-	-	1	-	2	-	200	12	14	3
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	1	-	-	1	-	-	-	20	-	-	1
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-20%
'90	00%	00%	50%	-92%
'96	00%	00%	00%	+ 0%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	332	Dec:	40%
	'90	266		25%
	'96	20		0%
	'01	20		0%

Opuntia spp.																		
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	21	1
	90	-	-	-	-	-	-	2	-	-	2	-	-	-	133	6	7	2
	96	8	-	-	1	1	-	-	-	-	10	-	-	-	200	6	22	10
	01	2	-	-	1	-	-	-	-	-	3	-	-	-	60	5	18	3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+50%
'90	00%	00%	00%	+34%
'96	10%	00%	00%	-70%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	-
	'90	133		-
	'96	200		-
	'01	60		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	2	-	-	-	-	-	-	3	-	-	-	200	33	34	3
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	4	1	1	1	-	-	-	8	-	-	-	160	25	47	8
	01	-	4	4	2	-	2	-	-	-	12	-	-	-	240	29	42	12
D	84	-	-	10	-	-	-	-	-	-	5	-	5	-	666			10
	90	-	2	3	-	-	-	1	-	1	1	-	-	6	466			7
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	100			5
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	92%	38%	-39%
'90	25%	63%	75%	-66%
'96	11%	67%	00%	+25%
'01	33%	50%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	866	Dec:	77%
	'90	532		88%
	'96	180		11%
	'01	240		0%